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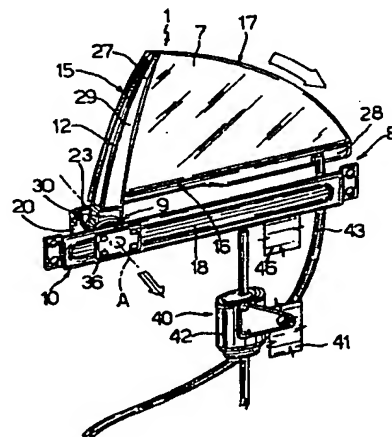
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(54) **A window-operating device for a motor vehicle, in particular for a convertible motor vehicle**

(57) A window-operating device (1) for a fixed or movable portion of a side (2) of a convertible motor vehicle, provided with a box-like body (3) defining a space (6) for accommodating an associated window (7); the window can be moved between a lowered position in which it is located completely within the space (6) in the box-like body (3), and a raised position in which it projects upwards from the box-like body (3); the device (1) has a support frame (8) carrying the window (7) and which is connected to the box-like body (3) of the side (2), and a male and female screw assembly (9) interposed between the window (7) and the frame (8), which enables the window (7) to turn about an axis (A), in use, transverse to the side (2), between the lowered and raised positions, and which causes the window (7) to translate along the axis (A) as it turns between the lowered and raised positions.

Fig.1



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## Description

[0001] The present invention concerns a window-operating device for a fixed or movable portion of a side of a motor vehicle, in particular, for a side of a convertible motor vehicle.

[0002] The term "side" is used in the present description and the claims in its broadest sense in order to indicate any element of the vehicle body laterally delimiting the motor vehicle and having an associated window. The aforesaid term therefore includes both the fixed elements of the vehicle body, for example, the fixed rear portions of the sides of the motor vehicles, as well as the movable side doors of the motor vehicles themselves, to which reference will be made below without loss of generality thereby.

[0003] As is known, the sides of convertible motor vehicles have at least one box-like body defining a space for accommodating an associated window which can be moved between a lowered, or open, position in which it is located completely inside the space in the box-like body, and a raised, or closed, position in which it projects upwards from the box-like body.

[0004] These sides generally have at least one window-operating device of the guide and slide type, generally including a pair of shoes connected to the window close to its lower edges and slidingly engaging associated vertical guides housed within the box-like body of the side, and a lever mechanism controlled manually or by means of an electric motor, which co-operates with a lower edge of the window in order to move the window itself along the aforesaid guides between the lowered and raised positions.

[0005] In the field of convertible motor vehicles, it is common for them to have windows having curved profiles that are more or less accentuated in order significantly to improve their aesthetic shape and visual impact. However, this leads to the necessity of making substantial modifications to the structure and shape of the inner shell of conventional motor vehicles, with significantly raised costs. In fact, utilising the conventional guide and slide devices for moving the windows of the aforesaid type makes it necessary to provide a specific curvature, both in the outer body of the sides intended to accommodate these windows in the lowered position, as well as in the inner shell of the motor vehicle.

[0006] In addition, using the aforesaid guide and slide devices for the vertical movement of windows having particularly marked arcuate profiles would give rise to a significant increase in the transverse size of the corresponding sides and, therefore, of the motor vehicle.

[0007] The object of the present invention is to produce a window operating device for a motor vehicle, in particular, for a convertible motor vehicle, which enables the disadvantages related to the use of the arcuate windows mentioned above to be overcome in a simple and economic way.

[0008] The aforesaid object is achieved by the present

invention in that it concerns a window-operating device for a side of a motor vehicle, in particular, for a side of a convertible motor vehicle, the said side including at least one box-like body defining a space for accommodating a related window, the said device being characterised in that it includes support means attached to the said box-like body of the said side, means for the attachment of the said window to turn with the said support means for enabling, in use, the window itself to turn about an axis transverse to the said side between a lowered position in which the said window is located completely inside the said space in the said box-like body, and a raised position in which the said window projects upwards from the said box-like body, and transmission means for moving the said window along the said axis while the window itself turns between the said lowered and raised positions.

[0009] For a better understanding of the present invention a preferred embodiment is now described, purely by way of non-limitative example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a window-operating device for a convertible motor vehicle, produced according to the present invention and disposed in a first operative position;

Figure 2 is a perspective view of the device of Figure 1 mounted in a related side of the motor vehicle and located in a second operative position;

Figure 3 is a perspective view on an enlarged scale of the device of Figure 1, with parts removed for clarity; and

Figure 4 is an exploded perspective view of the device of Figure 3.

[0010] With reference to the accompanying drawings, the reference numeral 1 generally indicates a window-operating device for a fixed or movable portion of a side 2 (Figure 2) of a convertible motor vehicle (not shown), in the example, for a door of the motor vehicle itself.

[0011] The side 2 comprises a box-like body 3 constituted by an outer body element 4 and an inner covering panel 5, and defines a space 6 for accommodating a related window 7 moved by the device 1.

[0012] According to the present invention, the device 1 essentially comprises a support frame 8 carrying the window 7 and attached, in use, to the body 3 of the side 2, and a male and female screw assembly 9 interposed between the window 7 and the frame 8, which enables the window 7 to move, in use, between a lowered, or open, position (Figure 2) in which it is completely housed in the space 6 in the body 3, and a raised, or closed, position (Figures 1, 3 and 4) in which the window 7 projects upwards from the body 3 itself; in particular, the assembly 9 enables the window 7 to turn, in use, about an axis A transverse to the body element 4 and the panel 5 of the side 2, between the lowered and raised positions, and causes the window 7 to translate

along the axis A itself during this turning movement.

[0013] The frame 8 includes an attachment assembly 10 firmly fixed to the body 3 of the side 2 at an upper opening 11 in the body 3 itself, and a support element 12 fixed peripherally to the window 7 and movably attached to the attachment assembly 10 by male and female screw assembly 9.

[0014] The window 7 is substantially triangular in shape and is laterally delimited by two edges 15, 16, substantially at right angles to each other, and by a curved edge 17 which connects the respective free ends of the edges 15, 16 themselves, and which is outwardly convex; in use, when the window 7 is in the raised position, the edge 15 extends vertically out of the body 3 and the edge 16 extends horizontally along the opening 11 while, when the window 7 is in the lowered position, the edge 15 extends horizontally along the opening 11 and the edge 16 extends vertically within the space 6 within the body 3 itself.

[0015] The attachment assembly 10 includes a substantially flat, elongate plate 18 fixed by screws 19 at its end to an upper portion of the panel 5 of the body 3 in correspondence with the opening 11 and which extends, in use, at right angles to the axis A.

[0016] The plate 18 has an integral flat element 20 which projects at right angles from an end portion and extends, in use, towards the body element 4 of the body 3; the attachment assembly 10 further includes an L-shape bracket 23 with a first flat portion 24 at right angles to the plate 18 and releasably attached to the element 20 by means of associated screws 25, and a second flat portion 26 facing the plate 18 and disposed, in use, against an inner face of the body element 4.

[0017] The support element 12 is substantially L-shape and includes first and second arms 27, 28, substantially at right angles to each other and fixed to the respective edges 15, 16 of the window 7. In particular, the arm 28 projects from the arm 27 and subdivides the arm 27 itself into a main portion 29 firmly attached to the edge 15 of the window 7, and an end portion 30 terminating in an internally threaded cylindrical tubular element which is, in use, coaxial with the axis A and defines a nut 31 of the screw assembly 9.

[0018] The assembly 9 further includes a screw 32 with an axis A supported firmly between the plate 18 and the portion 26 of the rod 27 which coaxially engages the nut 31.

[0019] According to an important characteristic of the device 1, when the window 7 is in the lowered position, the arm 27 of the support element 12 is disposed horizontally within the opening 11 so that, together with associated seals (not shown) of the window 7, it closes the opening 11 itself and, therefore, the space 6 in the body 3.

[0020] With particular reference to Figure 4, the screw 32 projects fully from the portion 26 of the rod 23, and has an axial blind hole 33 engaged, in use, by a centring pin 34 located so that it passes through a hole 35 in the

plate 18 and projects completely from a plate 36 fixed by screws to a face of the plate 18 facing the interior of the motor vehicle.

[0021] Finally, the nut 31 and screw 32 have respective threads 37, 38 inclined with respect to the axis A in such a way that as the window 7 turns from the raised position to the lowered position, it translates along the axis A towards the interior of the motor vehicle.

[0022] With reference to Figure 1, the device 1 finally includes an electric drive unit 40 (known and therefore not described in detail) co-operating with the assembly 9 in order to move the window 7 between the lowered and raised positions.

[0023] The drive unit 40 is of the kind having a movable cable and essentially includes a support body 41, an electric motor 42 carried by the body 41 and an output cable 43 axially moved by the electric motor 42 and attached to a free end portion of the arm 28.

[0024] Preferably, the body 41 is fixed to a rod 46 projecting from the plate 18 in such a way that the drive unit 40, the frame 8, the window 7 and the male and female screw assembly 9 together define a unit which can be pre-assembled and mounted in the body 3 of the side 2.

[0025] From an examination of the characteristics of the device 1 formed according to the present invention, the advantages conferred thereby are clear.

[0026] In particular, the male and female screw assembly 9 enables the associated window 7 to turn about the axis A from the raised position to the lowered position and vice versa, with a contemporaneous translation of the window 7 itself along the axis A towards the interior of the motor vehicle and vice versa. Therefore, by virtue of this movement, the curved profile of the window 7 does not interfere with the structure or shape of the internal shell of the motor vehicle, which cannot have specific curvature; this means that it is possible, without a related increase in costs, to utilise a large variety of windows having a curvilinear shape, and, in particular, cylindrical windows. This system of movement also enables the transverse sizes of the related motor vehicles provided with windows having particularly accentuated arcuate profiles to be limited.

[0027] In addition, the combined turning and translation movement caused by the screw assembly 9 facilitates the movement of the window between the lowered and raised positions, in that any sliding between the window 7 itself and the associated seals on the side 2 is reduced to a minimum.

[0028] Preferably, the frame 8, the window 7, the screw assembly 9 and the drive unit 40 define an assembly that can be pre-assembled, enabling operations for mounting the device 1 on the side 2 to be significantly simpler than those for mounting conventional window-operating devices.

[0029] Finally, according to a secondary characteristic of the present invention, the arm 27 of the support element 12 is shaped so that, together with the seals for the window 7, the space 6 in the side is closed when the

window 7 itself is in the lowered position.

[0030] Finally, it is clear that modifications and variations can be introduced to the device 1 which do not depart from the ambit of protection of the present invention.

[0031] In particular, the support body 41 of the drive unit 40 could be fixed directly to the box-like body 3 of the side 2.

[0032] In addition, the electric drive unit 40 could be replaced by a manual drive unit comprising a control handle on the panel 5 of the side 2, and a transmission unit for the motor interposed between the handle itself and the arm 28 of the support element 12.

#### Claims

1. A window-operating device (1) for a side (2) of a motor vehicle, in particular for a side of a convertible motor vehicle, the said side (2) including at least one box-like body (3) defining a space (6) for accommodating an associated window (7), the said device (1) being characterised in that it includes support means (8) attached to the said box-like body (3) of the said side (2), means (9) for the attachment of the said window (7) for turning movement with the said support means (8) to enable the window (7) to turn, in use, about an axis (A) transverse to the said side (2) between a lowered position in which the said window (7) is located completely within the said space (6) in the said box-like body (3), and a raised position in which the said window (7) projects upwards from the said box-like body (3), and transmission means (37, 38) for causing the translation of the said window (7) along the said axis (A) during the turning of the window (7) between the said lowered and raised positions.
2. A device according to Claim 1, characterised in that it includes drive means (40) co-operating with the attachment means (31, 32) and the said transmission means (37, 38) in order to move the said window (7) between the said raised and lowered positions, and in that the said support means (8), the said window (7), the said attachment means (9), the said transmission means (37, 38) and the said drive means (40) define a unit which can be pre-assembled and mounted on the said side (2).
3. A device according to Claim 1 or 2, characterised in that the said support means (8) include fixing means (10) attached firmly to the said box-like body (3), and in that the said attachment means and the said transmission means include a male and female screw assembly (9) interposed between the said fixing means (10) and the said window (7).
4. A device according to Claim 3, characterised in that the said male and female screw assembly (9)

includes a screw (32) coaxial to the said axis (A), in use, and attached to one of the said window (7) and the said fixing means (10), and a nut (31) engaged by the said screw (32) and carried by the other of the said window (7) and said fixing means (10).

5. A device according to Claim 4, characterised in that the said screw (32) and the said nut (31) have associated threads (38, 37) inclined with respect to the said axis (A) in such a way as to cause the window, during its turning movement from the said raised position to the said lowered position, to move along the said axis (A) towards the interior of the said motor vehicle.
6. A device according to Claim 4 or Claim 5, characterised in that the said support means (8) include a support element (12) fixed peripherally to the said window (7) and movably attached to the said fixing means (10) by means of the said male and female screw assembly (9), the said screw (32) being fixed to the said fixing means (10) and the said nut (31) being fixed to the said support element (12).
7. A device according to Claim 6, characterised in that the said fixing means (10) include an elongate plate (18) fixed to the said box-like body (3) in correspondence with an upper opening (11) therein, and in a direction transverse to the said axis (A), the said screw (32) being carried on the said plate (18) and projecting from the plate (18) itself, the said support element (12) including at least one elongate arm (27) fixed to a side edge (15) of the said window (7), provided at one of its ends with the said nut (31) and which closes the said upper opening (11) in the said box-like body (3) when the said window (7) is in the said lowered position.
8. A device according to Claim 7, characterised in that the said drive means include an electric drive unit (40), and in that the said plate (18) has a bracket (46) for fixing the said electric drive unit (40).

Fig.1

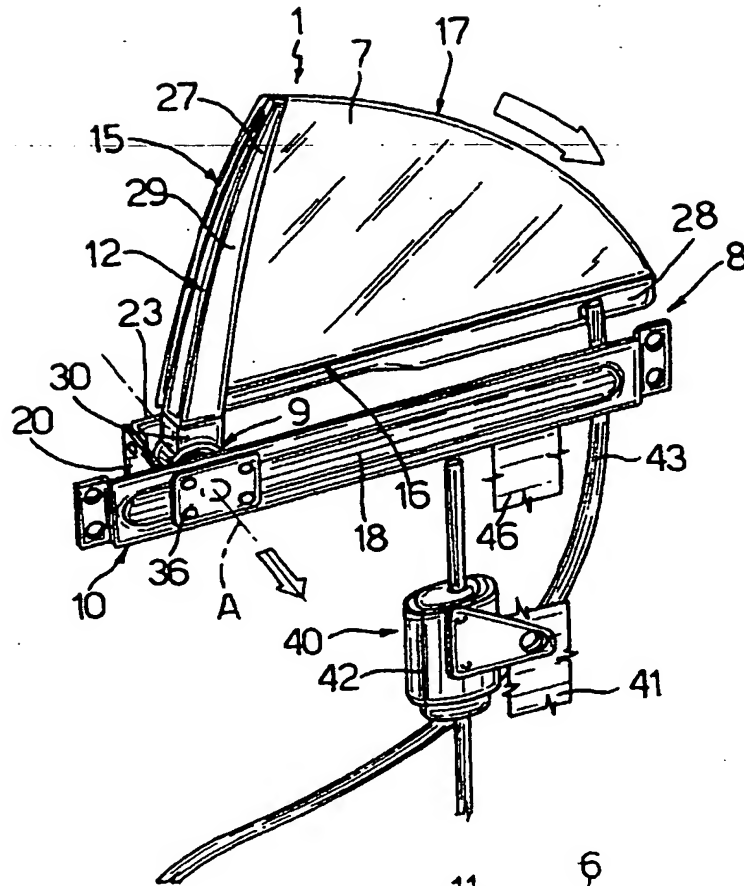


Fig.2

